

# PATENT SPECIFICATION

## DRAWINGS ATTACHED



921,126

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### COMPLETE SPECIFICATION

#### Turbo-Generators

We, ARTIENGESELLSCHAFT BROWN, BOVERI & CIE., of Baden, Switzerland, a Swiss Company, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

The invention relates to turbo-generators wherein the rotor winding as well as the stator iron are cooled by means of a gas and the stator winding is cooled by means of a liquid.

This type of machine which nowadays has to be built for very high powers, has a considerable length which involves certain difficulties regarding direct cooling of the conductors. The tendency is therefore to improve the removal of the heat losses in such a manner that a rational and effective cooling is easily achieved, even for machines having long bar conductors.

The object of the present invention is to achieve an improvement with respect to the arrangements used hitherto, and the desired results is obtained in that the gaseous coolant is passed to the middle of the machine between the stator core and the casing; then through radial slots in the stator iron from the outside towards the inside of the stator iron, then the coolant is deflected in an axial direction through longitudinal channels in the stator iron towards each outer end of the stator iron from whence it passes through pressure plates at the stator ends into end spaces, the gaseous coolant being extracted from said spaces by means of fans fixed to the rotor shaft and passed back to the middle of the machine by way of coolers.

A turbo-generator is shown in the accompanying drawing as a constructional example of the present invention.

The turbo-generator in this example comprises a rotor 1 and a stator 2 which are located in a gastight casing 3 filled with a gaseous coolant, for instance hydrogen. The

stator 2 includes a laminated stator iron core 4 with pressure plates 5 and stator winding 6. Longitudinal cooling channels 7 are provided in the stator iron. The conductors of the stator winding 6 are cooled directly with a liquid, for instance water or oil, by known means and for this purpose the conductors' bars are made partly hollow or cooling ducts are provided in the winding slots. The rotor 1 is also provided with axial cooling channels for cooling directly the conductors in a manner known *per se*, and the middle of the machine these channels are in communication with an air gap 9 of the machine by way of ports 8. A fan 11 is mounted on each end of rotor shaft 10, and 12 indicates coolers which are located in the longitudinal space between the stator core and the casing 3.

The method of operation of the cooling arrangement is as follows:—

Due to the suction of the fans, the coolant gas between the casing and stator core flows to the middle of the machine then through radially directed slots 13 provided in the laminated stator core 4, the gas flowing from the outside towards the inside, and after being deflected by 90° then passes along the longitudinal channels 7 in opposite directions through the stator iron, finally discharging through passages in pressure plates 5 into end spaces 14. The gas which has become heated in the stator iron is conveyed from the end spaces 14 by means of the fans 11 to the coolers 12 and after giving up its heat flows from the coolers at each end back again to the middle of the machine where it re-enters the stator iron core 4.

For the purpose of cooling the rotor 1, part of the gas for example after leaving the coolers 12 flows through by-pass ducts 15 to both ends of the rotor where it enters axially extending cooling channels and passes to the middle of the rotor where it flows by way of the ports 8 into the air gap 9

[Price 4s. 6d.]

Price 5s.

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COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of  
the Original on a reduced scale*

